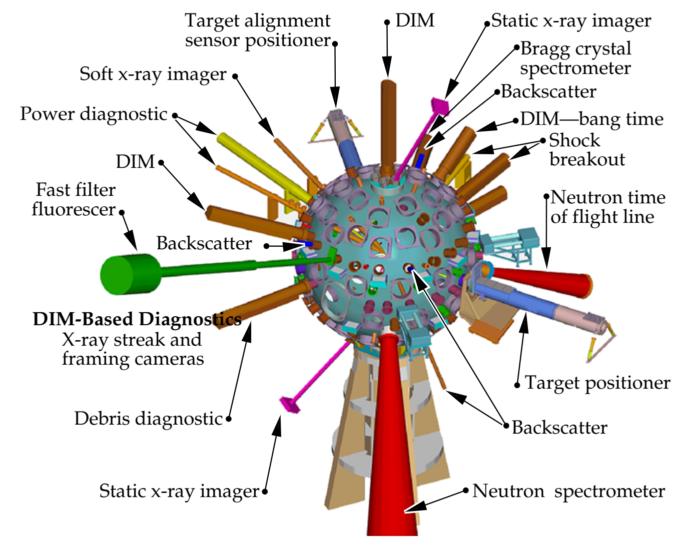
INERTIAL CONFINEMENT FUSION
Lawrence Livermore National Laboratory

Monthly Highlights

November 1999

UCRL-TB-128550-00-02

Assignment of NIF Core Target Diagnostics. A memorandum of understanding has been signed by the Inertial Confinement Fusion (ICF) program managers agreeing to the scientific responsibility for the National Ignition Facility (NIF) core target diagnostics. These are the diagnostics needed for laser verification and for the early target experiments. The institutions involved in the design, construction, and initial deployment are Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Sandia National Laboratories, University of Rochester's Laboratory for Laser Energetics (UR-LLE), and the Naval Radiation Laboratory. These core target diagnostics will become part of the NIF diagnostic suite, to be operated and maintained by the facility. The assignment includes comprehensive use of diagnostic instrument manipulators (DIMs), as shown below, allowing diagnostics to be interchanged between different locations.



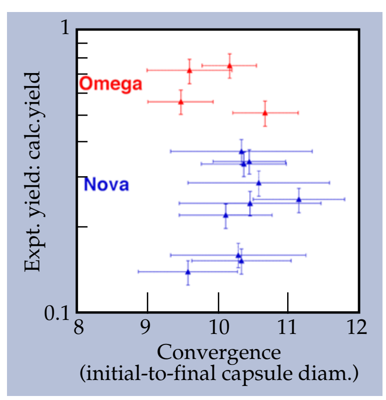
These core target diagnostics will be part of the NIF diagnostic suite.

Two New APS Fellows in ICF. The American Physical Society (APS) this month elected to fellowship Livermore researchers Michael Key and Peter Young. Both are members of the Lab's ICF Program. Key is the Lab's Deputy Scientific Director for ICF/NIF. He was cited by the APS for his pioneering work in the invention of the x-ray laser, for developing techniques to maximize laser output, and for originating the technique of x-ray backlighting. Young, the ICF Program's Group Leader for Plasma Physics, was recognized for his research into how intense laser pulses move through plasma. Such intense pulses create nonuniformity in the plasma, bending the laser light and refocusing it. Understanding this phenomenon is important in many applications, particularly ICF, where it is important to control the laser spot in order to better focus laser energy on target.

Target Chamber Boom Coming Together. The graphite fiber-reinforced composite boom for the NIF target positioner is under construction at the West Jordon, Utah, facility of R^3 Composites. The advanced composite was chosen both for its high stiffness-to-mass ratio, necessary to attain the low vibration amplitude (≈3 µm) required, and for its very small longitudinal coefficient of thermal expansion. The boom design envelope and vibrational characteristics were determined by LLNL; the composite selection, final configuration, and detailed layup design were done by R^3 in cooperation with their parent company, Composite Optics, Inc. The cylindrical section of the boom is laid up on aluminum mandrels in two sections that will form a 5.485-m-long final assembly.

The target positioner boom will place NIF targets in the Target Chamber.

OMEGA Experiments Show Improved Drive Symmetry. Recent experiments conducted by LLNL on the OMEGA laser at UR-LLE show the effects of improved drive symmetry. Low-convergence, 50-atm, deuterium-filled fusion fuel capsules have been shot at both OMEGA and at Nova (40 and 10 beams, respectively). The figure below shows each experiment's measured neutron yield divided by the calculated yield for that shot. OMEGA's superior yield reflects the larger number of beams (arranged in multiple "cones"), which enable the greater drive symmetry. The *x*-axis measures the ratio of the target's initial-to-final diameter; a larger convergence means greater fuel compression. NIF's 192-beam arrangement is similar to the OMEGA configuration, and can be expected to impart even higher drive symmetry than these results.



OMEGA's greater drive symmetry improves yield and convergence.

For comments about content of the *Monthly Highlights*, contact Bob Kauffman (925) 422-0419.
To get on the mailing list of the *LLNL ICF Monthly Highlights*, *Quarterly Report*, or *Annual Report* send a request to carpenter13@llnl.gov
These reports and other LLNL ICF Program information are available on our Web page at http://lasers.llnl.gov/lasers/inertial.html
This work was performed under the auspices of the U.S. Department of Energy by University of California Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.